

# JAPAN

## EDICT OF GOVERNMENT

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JIS A 5536 (1996) (English): Adhesives for resilient floorcoverings and woody floorings

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*The citizens of a nation must  
honor the laws of the land.*

Fukuzawa Yukichi

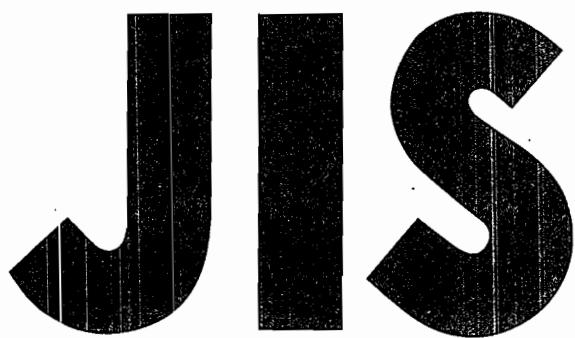
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**JAPANESE INDUSTRIAL STANDARD**

**Adhesives for  
floorcovering — P.V.C.**

 **JIS A 5536**—1996

**Translated and Published**

**by**

**Japanese Standards Association**

**In the event of any doubt arising,  
the original Standard in Japanese is to be final authority**

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Errata are also provided to subscribers of JIS (English edition) in *Monthly Information*.



1. Scope This Japanese Industrial Standard specifies the adhesives (hereafter referred to as "adhesives") to be used for bonding floorcovering - P.V.C.(<sup>1</sup>).

Note (<sup>1</sup>) These are floorcovering tiles and floorcovering sheets specified in JIS A 5705.

Remarks 1. The standards cited in this Standard are mentioned in Attached Table. 1.

2. The units and numerical values in { } in this Standard are based on the traditional units and are appended for informative reference.

## 2. Type

2.1 Classification by main component Adhesives are classified as shown in Table 1 by their main components.

Table 1. Classification by main components

Type	Description
Vinyl acetate resin series emulsion type	Emulsion type adhesives whose main component is vinyl acetate resin
Vinyl acetate resin series solvent type	Solvent type adhesives whose main component is vinyl acetate resin
Vinyl copolymer resin series emulsion type	Emulsion type adhesives whose main components are acrylic-vinyl acetate copolymer resin and ethylene-vinyl acetate copolymer resin
Vinyl copolymer resin series solvent type	Solvent type adhesives whose main components are acrylic-vinyl acetate copolymer resin and ethylene-vinyl acetate copolymer resin
Acrylic resin series emulsion type	Emulsion type adhesives whose main component is acrylic resin
Rubber series latex type	Latex type adhesives whose main component is natural rubber or synthetic rubber
Epoxy resin series	Two-part adhesives of which base resin is epoxy resin and of which curing agent is polyamines

2.2 Classification by uses Adhesives are classified as shown in Table 2 by their uses.

Table 2. Classification by uses

Classification		Uses
Use for general purpose	For P.V.C. floor tiles, for P.V.C. floor sheets, and for P.V.C. floor tiles and P.V.C floor sheets	After bonding, they are used where there is no influence of water.
Use for waterproof purpose		After bonding, they are used where there is influence of water.

Remarks : This includes the cases where they are used on risers of a staircase or the vertical of a baseboard.

3. Quality The quality of adhesives shall be as follows.

- (1) The adhesive shall be uniform in quality and free from alien matter thought to be harmful to bonding.
- (2) The adhesive shall not give damage to the adjoining P.V.C. floor tile, P.V.C. floor sheet, or its backing on which the adhesive is applied.
- (3) The adhesive shall be easily applied and the ridge made by comb-shaped trowel shall not seriously be destroyed when it is tested in accordance with 4.3.1.
- (4) The bond strength of the adhesive shall meet the requirements shown in Table 3.
- (5) The adhesive shall conform to the quality specified in (1) to (4) even after being kept during the term of effectiveness or until its expiration date of effectiveness at the ordinary temperature and ordinary humidity <sup>(2)</sup>.

Note <sup>(2)</sup> The ordinary temperature and ordinary humidity mean the standard atmospheric condition specified in JIS Z 8703 [temperature  $20 \pm 15^{\circ}\text{C}$  and humidity  $(65 \pm 20) \%$ ].

Table 3. Bond strength

Kind of floorcovering material	Item for characteristic	Service	Test condition	Type of adhesives							Test sub-clause to be applied
				Vinyl acetate resin series		Vinyl copolymer resin series		Acrylic resin series emulsion type	Rubber series latex type	Epoxy resin series	
				Emulsion type	Solvent type	Emulsion type	Solvent type				
Floor tile	Tensile bond strength N/mm <sup>2</sup> (kgf/cm <sup>2</sup> )	Use for general purpose	Ordinary condition	0.5 {5.10} min.	0.5 {5.10} min.	0.2 {2.04} min.	0.5 {5.10} min.	0.2 {2.04} min.	0.2 {2.04} min.	0.8 {8.16} min.	4.3.2 (4) (a)
		Use for waterproof purpose		—	—	—	—	—			
		Use for general purpose	Immersion in water	—	—	—	—	—	—	0.5 {5.10} min.	4.3.2 (4) (b)
		Use for waterproof purpose		—	—	—	—	—	—		
Floor sheet	90° peel bond strength N/25 mm (kgf/25 mm)	Use for general purpose	Ordinary condition	20.0 {2.04} min.	20.0 {2.04} min.	20.0 {2.04} min.	20.0 {2.04} min.	10.0 {1.02} min.	10.0 {1.02} min.	20.0 {2.04} min.	4.3.3 (5) (a)
		Use for waterproof purpose		—	—	—	—	—	—		
		Use for general purpose	Immersion in water	—	—	—	—	—	—	10.0 {1.02} min.	4.3.3 (5) (b)
		Use for waterproof purpose		—	—	—	—	—	—		

Remarks : When the bond strength is not more than the value given in this Table, if the breaking spot (Fig. 1) showing the maximum area is in F, the test result shall be acceptable.



Fig. 1. Condition of breaking

P.V.C. floor tile or P.V.C. floor sheet		Symbol	Spot of breaking
	F	F	P.V.C. floor tile or P.V.C. floor sheet
	AF	AF	Interface between the adhesive and P.V.C. floor tile or P.V.C. floor sheet
	A	A	Adhesive
	GA	GA	Interface between backing and adhesive
	G	G	Backing

#### 4. Test

##### 4.1 General conditions for test

General condition for test shall be as follows.

- (1) Unless otherwise specified, test pieces shall be prepared under the standard atmospheric condition. The standard atmospheric condition shall be 20°C class 2, 65% class 10 [temperature of  $20 \pm 2^\circ\text{C}$ , humidity ( $65 \pm 10$ ) %] specified in JIS Z 8703.
- (2) Materials and tools to be used for adhesive and test shall be let stand at least for 24 h before preparing in the room kept at standard condition.
- (3) When being tested, adhesive shall be sufficiently stirred.
- (4) When epoxy resin series adhesive is tested, base resin and curing agent shall be taken with the rate specified by manufacturer, then be put on the glass plate measuring about 30 cm by 30 cm and about 5 mm in thickness to make the weight of the mixture about 300 g, and be immediately kneaded well to get uniform condition using a suitable spatula.
- (5) Aging condition for the test pieces for bond strength test shall be as shown in Table 4.

Table 4. Aging condition of test pieces

Test condition	Aging condition	Type of adhesives
Ordinary condition	168 h under standard condition <sup>(3)</sup>	Vinyl acetate resin series emulsion type adhesives Vinyl copolymer resin series emulsion type adhesives Acrylic resin series emulsion type adhesives Rubber series latex type adhesives
	48 h under standard condition	Vinyl acetate resin series solvent type adhesives Vinyl copolymer resin series solvent type adhesives Epoxy resin series adhesives
Immersion in water	168 h in water <sup>(4)</sup> after 48 h under standard condition	Epoxy resin series adhesives

Notes <sup>(3)</sup> Standard condition is a state of  $20 \pm 2^\circ\text{C}$  in temperature and ( $65 \pm 10$ ) % in humidity.

<sup>(4)</sup> In water means a state of being immersed in pure water of the temperature of  $20 \pm 2^\circ\text{C}$ .

4.2 Materials and tools for test Materials and tools for test shall be as follows.

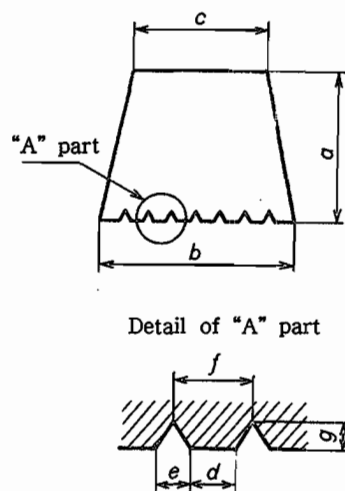
- (1) Materials and tools for test shall be as shown in Table 5 or at least equivalent.

Table 5. Materials and tools

Materials and tools	Quality of materials
Fiber reinforced cement board	Flexible slate board specified in JIS A 5430
Floor tile	P.V.C. floor tile specified in JIS A 5705
Floor sheet	P.V.C. floor sheet specified in JIS A 5705
Glass plate	Sheet glasses specified in JIS R 3201
Comb-shaped trowel	SS330 specified in JIS G 3101
Steel attachment	

- (2) The spreading tool for test shall be a comb-shaped trowel. The shape and dimension of the comb-shaped trowel shall be as shown in Fig. 2, and of  $0.8 \pm 0.2$  mm in thickness.

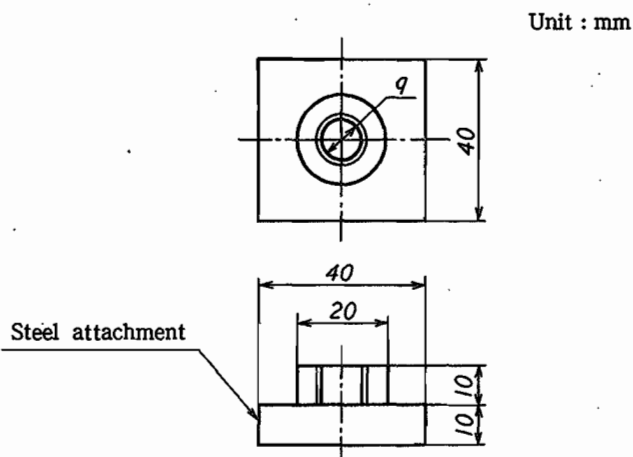
Fig. 2. Comb-shaped trowel



Unit : mm	
Place	Size
a	$130 \pm 10$
b	$150 \pm 5$
c	$85 \pm 5$
d	$3 \pm 0.2$
e	$2 \pm 0.2$
f	$5 \pm 0.5$
g	$2 \pm 0.2$

- (3) The area to be bonded of the steel attachment used for preparing a test body of tensile bond strength test shall be 40 mm by 40 mm and its shape and dimensions shall follow Fig. 3.

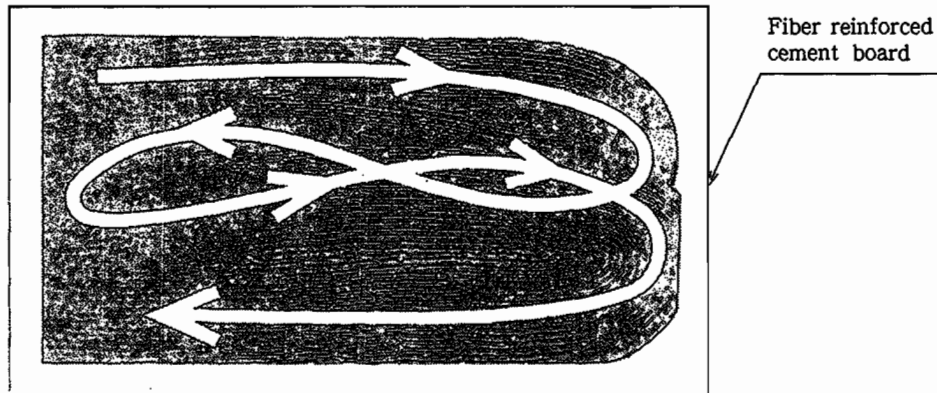
Fig. 3. Steel attachment



#### 4.3 Test

4.3.1 Spreadability Put adhesive on a flat-surfaced fiber reinforced cement board (flexible board), measuring about 30 cm by 60 cm and 8 mm in thickness, spread it as shown in Fig. 4 using a comb-shaped trowel standing aslant on the board, and observe its spreadability and the ridges made by the comb-shaped trowel.

Fig. 4. Spreadability test



4.3.2 Tensile bond strength The test on tensile bond strength shall be as follows.

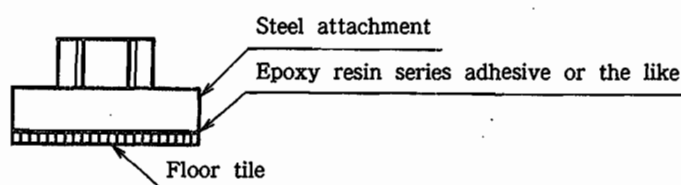
##### (1) Materials for testing

- (a) Backing The backing shall be fiber reinforced cement board (flexible board) measuring 70 mm by 70 mm and 8 mm in thickness. Its surface shall be cleaned to be free from dust or other alien matter.
- (b) Floor tile for test The floor tile for test shall be the steel attachment on which the flat surface of floor tile is bonded with epoxy resin series adhesive<sup>(5)</sup><sup>(6)</sup> or the like as shown in Fig. 5.

Notes <sup>(5)</sup> This adhesive shall have stronger bond strength than that of the adhesive specified in Table 3.

- (6) In bonding the steel attachment, with a view of securing the adhesion, the surface of floor tile may be treated by the method not affecting the surface of floor tile such as sanding.

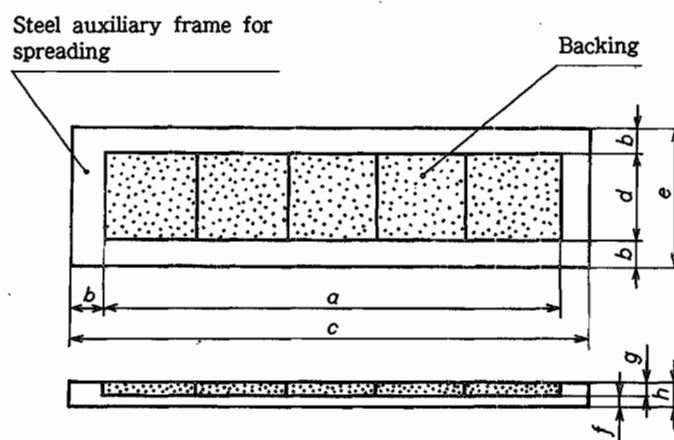
Fig. 5. Floor tile for test



- (2) Preparation of test body A test body shall be prepared as follows.

- (a) Spreading of adhesive to be tested When spreading the adhesive to be tested, use a steel auxiliary frame for spreading shown in Fig. 6, fix five backings with flat surface upward and without making any gap, paste the three sides of flat surface of the backing with adhesive tape specified in JIS Z 1525 to cover the surface by approx. 7 mm as shown in Fig. 7, put suitable amount of the adhesive to be tested on it, stand aslant the comb-shaped trowel on it, and spread uniformly the adhesive on the five backings by drawing the trowel toward this side with both hands without rest. Peel off the adhesive tape immediately after spreading.

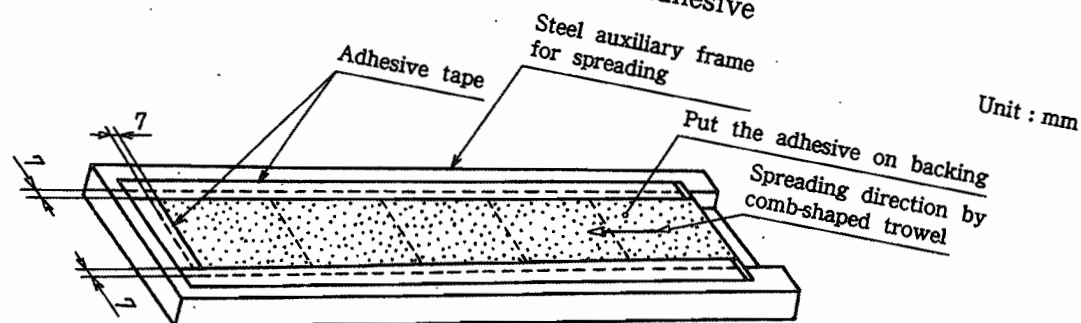
Fig. 6. Steel auxiliary frame for spreading



Unit : mm

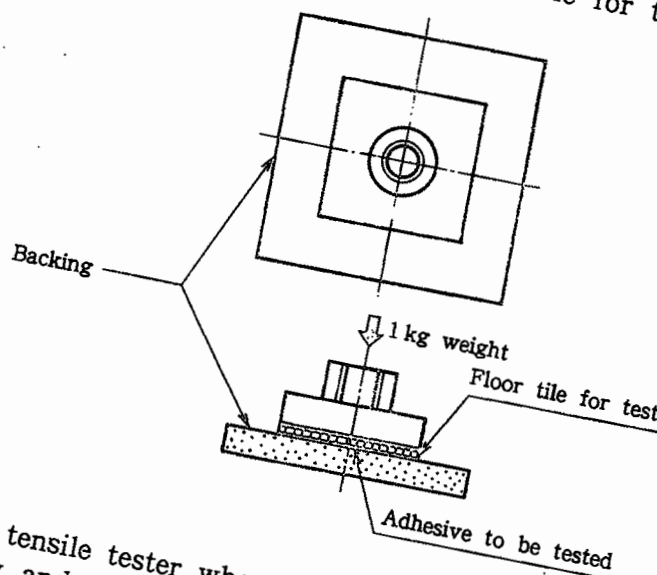
Place	Dimension	Place	Dimension
a	350 ± 1	e	110 ± 5
b	20 ± 2	f	10 ± 4
c	390 ± 5	g	8 ± 0.1
d	70 ± 0.5	h	18 ± 4

Fig. 7. Spreading of adhesive



- (b) Bonding of floor tile for test After spreading the adhesive to be tested, put gently five floor tiles for test specified in (1)(b) on the center of each backing on which the adhesive has been spread within the limit of waiting time specified by the manufacturer, put 1 kg weight on each backing for about 5 s, then remove the weight, and age them for 168 h as shown in Fig. 8. In case of such as vinyl acetate resin series solvent type adhesive, vinyl copolymer resin series solvent type adhesive, or epoxy resin series adhesive, however, age them for 48 h.

Fig. 8. Bonding of floor tile for test



- (3) Tester The tensile tester whose breaking load is equivalent to 15% to 85% of its capacity and displacement speed is controllable to 3 mm/min shall be used.
- (4) Testing method Tests shall be carried out as follows.
- (a) Ordinary tensile bond strength Attach the test body prepared according to (2) to the tester using a jig shown in Fig. 9 and a steel caul shown in Fig. 10 by the methods given in Fig. 11, carry out tensile test, and measure the maximum load when it is broken. Make displacement speed 3 mm/min.

Fig. 9. Test jig for tensile bond strength test

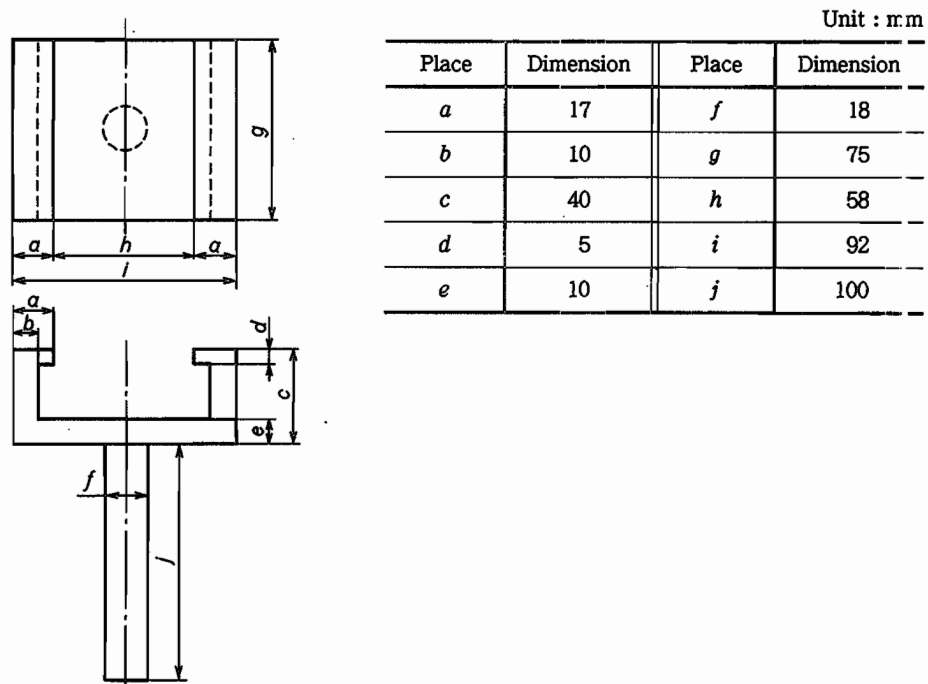


Fig. 10. Steel caul

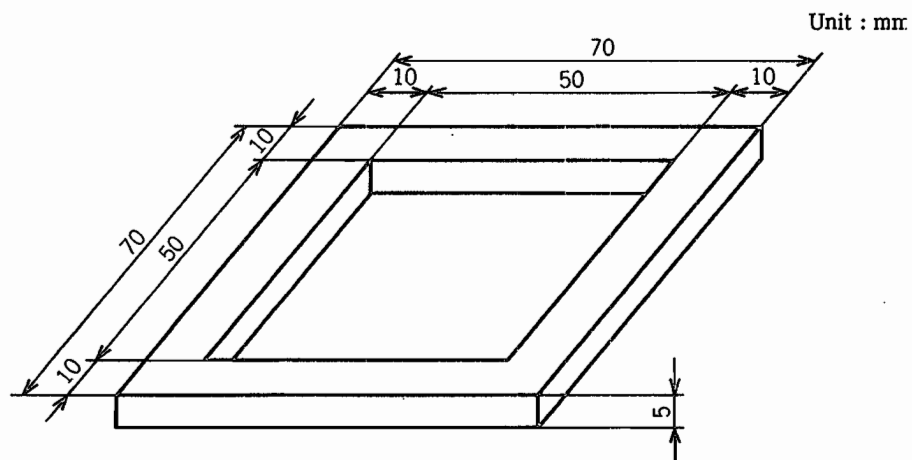
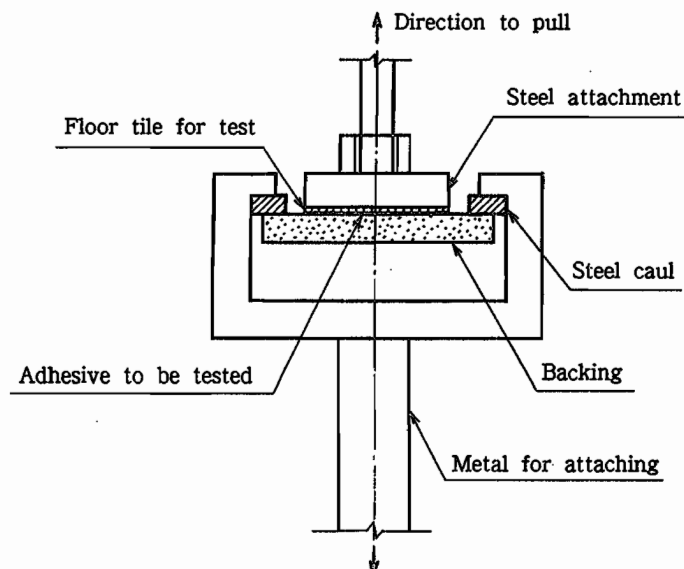
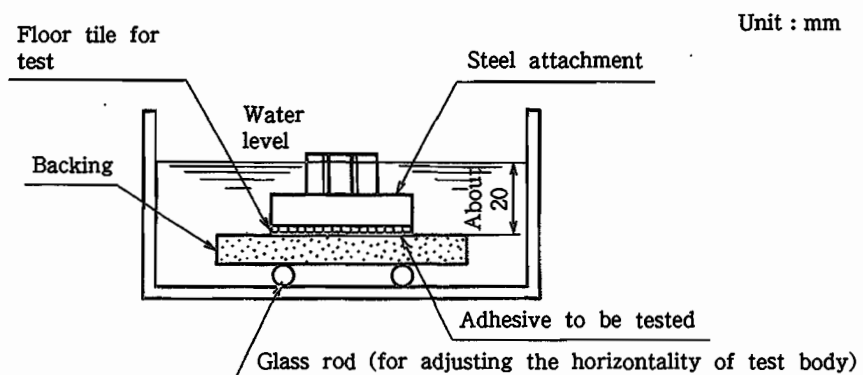


Fig. 11. Ordinary tensile bond strength test



- (b) Tensile bond strength in water Immerse the test body prepared according to (2) in pure water kept at  $20 \pm 2^\circ\text{C}$  for 168 h as shown in Fig. 12, and carry out tensile test similarly to (a) immediately after taking it out of water.

Fig. 12. Immersion of test body in water



- (c) Calculation of tensile bond strength The tensile bond strength at (a) and (b) shall be calculated in accordance with the following formula.

$$F = \frac{P}{A}$$

where,  $F$ : tensile bond strength ( $\text{N}/\text{mm}^2$ ) { $\text{kgf}/\text{cm}^2$ }

$P$ : maximum load (N) { $\text{kgf}$ }

$A$ : area of floor tile for test ( $\text{mm}^2$ ) { $\text{cm}^2$ }

The tensile bond strength shall be the average of values of five test bodies, and it shall be expressed to the first decimal place in accordance with JIS Z 8401.

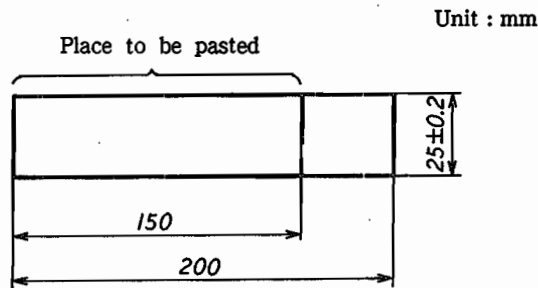
If there are test bodies breaking at the interface of a steel attachment and floor tile, retest test bodies equal to the number of broken bodies, and calculate an average of values for five bodies having no breakage.

4.3.3 90°C peel bond strength The test method for 90° peel bond strength test shall be as follows.

- (1) Materials for test The materials for test shall be as follows.

- (a) Backing The backing shall be fiber reinforced cement board (flexible board) measuring 70 mm in width, 150 mm in length and 5 mm to 8 mm in thickness. Its surface shall be cleaned to be free from dust or other alien matter.
- (b) Floor sheet for test Floor sheet for test shall be  $25 \pm 0.2$  mm in width and about 200 mm in length as shown in Fig. 13.

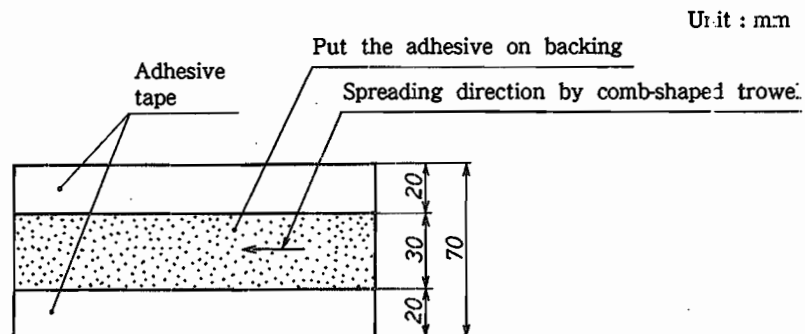
Fig. 13. Floor sheet for test



(2) Preparation of test body The preparation of a test body shall be as follows.

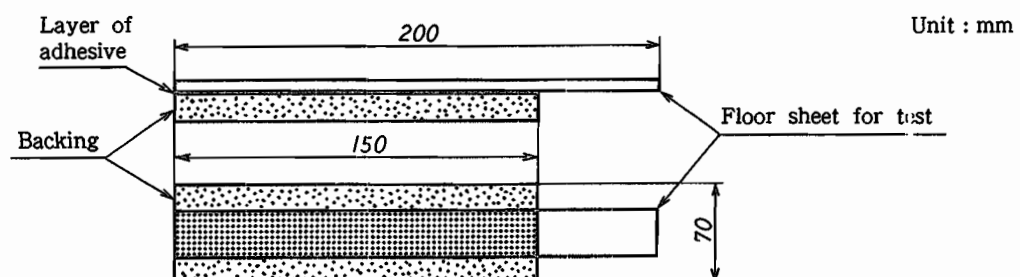
- (a) Spreading of adhesive to be tested When spreading the adhesive to be tested, paste the adhesive tape specified in JIS Z 1525 on the flat surface of a backing with 30 mm interval in width at the center as shown in Fig. 14, put suitable amount of the adhesive to be tested on the 30 mm width surface, stand aslant a comb-shaped trowel on it, and spread uniformly the adhesive by drawing the trowel to this side with both hands without rest. Peel off the adhesive tape immediately after spreading.

Fig. 14. Spreading of adhesive to be tested



- (b) Bonding of floor sheet for test After spreading the adhesive for test, make the end of floor sheet for test specified in (1) (b) meet with the end of backing as shown in Fig. 15, and paste them within the waiting time specified by the manufacturer. Move twice back and forth about 5 kg weighing hand roller having 25 mm width or more on the floor sheet for test to press, and age it for 168 h putting 10 g weight per 1 cm<sup>2</sup> floor sheet for test. In case of such as vinyl acetate resin series solvent type adhesive, vinyl copolymer resin series solvent type adhesive, and epoxy resin series adhesive, age them for 48 h.

Fig. 15. Bonding of floor sheet for test





- (3) Tester The tensile tester whose breaking load is equivalent to 15% to 85% of its capacity and displacement speed is controllable to 200 mm/min shall be used.
- (4) Jig The jig shall have shape and dimension as shown in Fig. 16, and when peeling the test body as shown in Fig. 17, shall have the structure to let the backing move horizontally in order to keep the peeling angle to be 90°.

Fig. 16. Jig for 90° peel bond strength test (example)

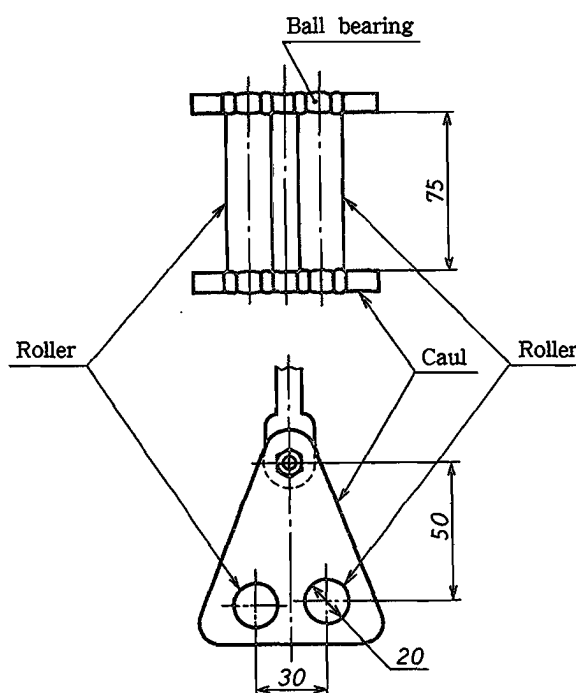
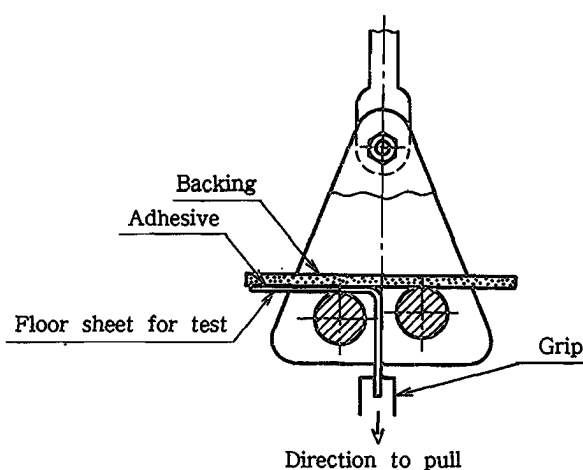


Fig. 17. 90° peel bond strength test



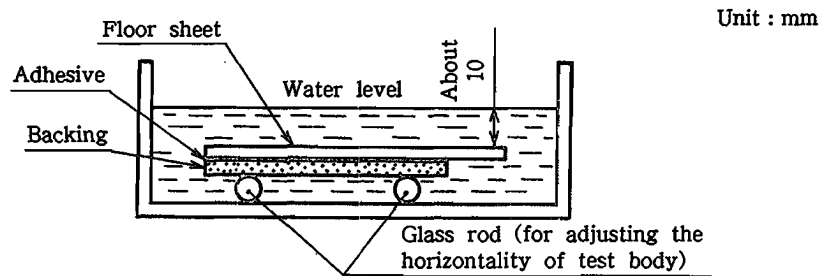
- (5) Test method Test shall be carried out as follows.

- (a) Ordinary 90° peel bond strength Pull floor sheet which has been protruded from the end of the backing of a test body prepared in (2), and peel at least

25 mm long. As shown in Fig. 17, fasten the peeled part of the floor sheet on grip, and peel the floor sheet at peeling angle of  $90 \pm 10^\circ$ . Continue the measuring at displacement speed of 200 mm/min until the bonded part remains about 25 mm or less.

- (b) 90° peel bond strength in water Immerse the test body prepared in (2) in pure water kept at  $20 \pm 2^\circ\text{C}$  for 168 h as shown in Fig. 18, and carry out peeling test similarly to (a) immediately after taking out of the water.

Fig. 18. Immersion of test body in water



- (c) Calculation of 90° peel bond strength Plot a loading graph given when peeling the floor sheet. As shown in Fig. 19, divide 60 mm of peeled length in the curve between peeling load and peeled length, after eliminating initial 25 mm, into four with 15 mm equal intervals, read loads needed for peeling ( $P_1, P_2, P_3, P_4, P_5$ ) which are intersections of dividing line and loading curve, and calculate peel bond strength in accordance with the following formula.

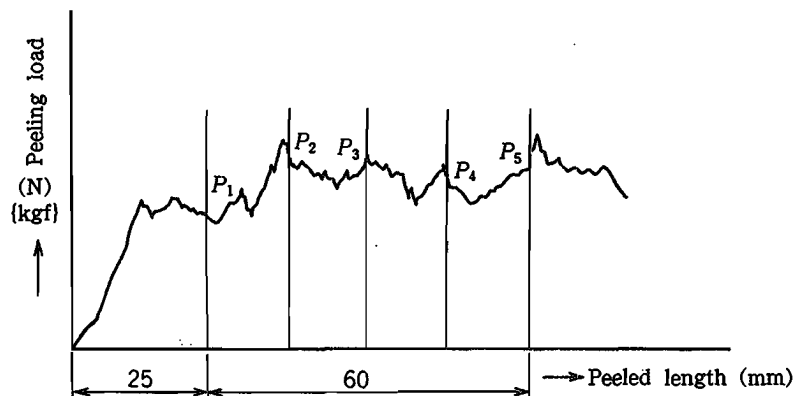
$$F = \frac{\sum_{i=1}^5 P_i}{5}$$

where,  $F$ : peel bond strength (N/25 mm) {kgf/25 mm}

$P_i$ : peeling load at "i" point (N) {kgf}

The peel bond strength shall be the average of values for five test bodies, and it shall be expressed to the first decimal place in accordance with JIS Z 8401.

Fig. 19. Curve between peeling load and peeled length



4.3.4 Specific gravity 6.1.1 of JIS K 6833 applies to the measurement of specific gravity.

4.4 Conversion of numerical values When converting the numerical values obtained in the test, using the tester or measuring instrument of the traditional unit, to the numerical values based on the International System of Units (SI), the following equation shall be used :

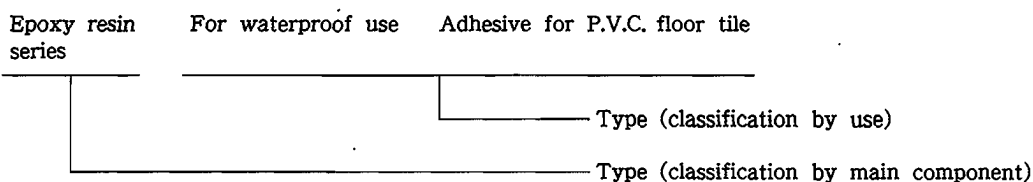
$$1 \text{ kgf} = 9.80 \text{ N}$$

5. Inspection When adhesive is inspected, decide lot size for sampling in accordance with JIS Z 9001, take sample using a rational sampling inspection plan, and if it meets the requirements in 3, judge it to be accepted.

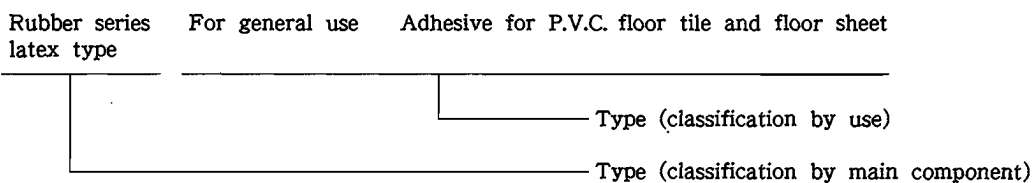
For 3.(5), the inspection is carried out when the technical manufacturing condition affecting quality is changed.

6. Designation of adhesives The designation of adhesives shall be as follows.

Example 1.



Example 2.



7. Marking Following items shall be marked on the container of adhesive with an indelible way.

- (1) Type
- (2) Name of manufacturer or its abbreviation
- (3) Date of manufacture
- (4) Expiration date of effectiveness or term of effectiveness
- (5) Limit time for bonding
- (6) Mixing ratio of base resin and curing agent
- (7) Net mass
- (8) Name or symbol of type specified in targeted floorcovering P.V.C.(JIS A 5705)

[Informative reference] Example of marking

Name of product		Manufacturer's name or its abbreviation		
Type		Targeted floorcovering P.V.C.(name of type or its symbol)		
Date of manufacture	Month, day, year	Limit time for bonding	min to	min
Term of effectiveness or expiration date of effectiveness	Month, year	Mixing ratio of base resin and curing agent		
Net mass	kg			

Attached Table 1. Cited standards

JIS A 5430	Fiber reinforced cement boards
JIS A 5705	Floorcovering - PVC
JIS G 3101	Rolled steels for general structure
JIS K 6833	General testing methods for adhesives
JIS R 3201	Sheet glasses
JIS Z 1525	Pressure sensitive adhesive polyvinyl chloride tapes for packaging
JIS Z 8401	Rules for rounding off of numerical values
JIS Z 8703	Standard atmospheric conditions for testing
JIS Z 9001	General rules for sampling inspection procedures



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